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ABSTRACT

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Rambling Through the Wilds: A Concept of Jagged Study Zones

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Abstract

The jagged study zone model helps designers to create educational environments which challenge the learner and make the learner to commit to the learning process. The characteristics of a jagged study zone can be explained by showing how its features are related to traditional closed and open learning environments. The requirements for a jagged study zone are identified by extracting the strengths and opportunities of the closed and open learning environments, and by combining them to the opposites of weaknesses and threats of those traditional environments. We show examples how the jagged study zones can be supported and discuss the role of the teacher when considering the jagged study zone model.

1. Introduction

In the recent discussion concerning meaningful technology for learning, the concept of "learning landscape" or open learning environment seems to refer to an environment that provides a learner with an activating, yet safe learning experience. The learning itself has become slightly dull and unexciting. From the arctic Finnish perspective, generations before us have considered learning not an easy or simple fun-like activity, but rather a painful experience that changes the learner at a fundamental level. Instead of referring to a tamed, village-like landscape with occasional woods and meadows for lovely picnics, learning can also be a process of blood, sweat, and tears. In our experience these dull learning landscapes rarely offer enough excitement and realistic challenges for every student. We do not argue that learning or education should always be extremely exciting, but on some occasions the appropriate amount of exhilaration might motivate the student to cope with very difficult domains.

At the same time the learning landscapes or open learning environments do not necessary offer enough guidance and counseling to the poorly motivated student. If the student is not capable of making the right choices, the learning environment most likely will not help her. Hence, the jagged study zone should take also care of a poor student; facilitating her with efficient learning products and support.

In this paper we will propose a model for building educational environments by introducing the concept of jagged study zones. Applying a jagged study zone one can cover most of the demands listed above.

2. Definition of the Jagged Study Zone

We begin our definition of a *jagged study zone* by examining the properties of two well-know learning contexts: a closed learning environment and an open learning environment. In a *closed learning environment* the teacher sets the goals and dictates for the tools used, pace, materials, schedule and the learning goals. Wilson (1995) characterizes the closed environment to be a construct, in which the students work by using facilities to collect and interpret information. The closed environment is restricted and rigid; the students are not able to work or express themselves freely. The metaphor for closed learning environment could be a product line of a factory. Student is a product traveling through the product line and the factory (educator) provides him with all the necessary information and knowledge.

To get free from the limitations of the closed learning environment Miller (1997) and Levi (1994) proposed an *open learning environment*, which is characterized by

1 being learner centered,
2 rich communication,
3 exploratory learning,

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4 the use of learning goals, and
5 possibilities to make decisions individually and in groups as they encounter problems.

Learning is directed and scaffolded, but not controlled or enforced to a certain model (Wilson 1995). The advocates of open learning environments claim that the motivation for learning comes from the learner herself.

We can combine the strong points of the closed and open learning environments into a novel concept. We begin by making a SWOT analysis of the closed and open learning environments (see tables 1 and 2) and combining the strengths and opportunities identified with the analysis. Then we will reinforce our concept by incorporating the *opposites* of the weaknesses and threats found in both approaches by introducing supporting facilities.

Strengths	**Weaknesses**
+ goal awareness + skill learning + efficient in closed tasks	- does not support initiative - suppresses creativity - narrow applicability
Opportunities	**Threats**
+ learning by gaming + utilizes external motivation	- trains learners into robots - promotes tunnel vision

Table 1: SWOT-analysis of a closed learning environment concept.

Strengths	**Weaknesses**
+ creative problem solving + own choices + variety of tools + individual paths	- hard to teach (lack of teacher control) - can be boring - lack of plot or narrative organization
Opportunities	**Threats**
+ develops autonomy + coaching - tutoring guidance + challenging for a motivated student + internal motivation	- traps, deadlocks - dependent variables - learning topologies

Table 2: SWOT-analysis of an open learning environment concept.

Learning environments based on adaptive hypermedia (Brusilovsky 2001) are good examples when closed learning environments have been transformed to be more flexible. Despite the introduction of adaptation, systems based on adaptive hypermedia are still confined environments, where system designers or learning material authors have to decide the rules by which educational materials are presented to the learner.

The *open market model* (Meisalo, Sutinen & Tarhio, 2000, 69-71; Meisalo & Lavonen, 2000) is a typical construct based on the open learning environment paradigm. This model structures the open environment and the activities of the learner therein. In the original market model, the student is considered to be a consumer in a large supermarket (computer). In the supermarket the customer makes highly individual choices that are relevant only for her. In the supermarket you can forget all the other customers or people, and the only important thing is to think about your own welfare and choices. In the open market model, referred above, both positive interaction of learners in the environment and the access to the world outside the supermarket, even wild nature, electronic workshops, etc., are emphasized. In the original field of application the interest has been primarily in science and technology education. Both the nature and the technological applications show often features that are far from smooth and ideal. This demonstrates that the idea of jagged study zones brings about new features to learning tools, like in our example of extending the original market model into the open market model.

The jagged study zone concept

We see Vygotsky's (1978) zone of proximal development as a component for jagged study zone, in which the student is encouraged to take the learning experience to the outer limits. The jagged study zone can be a harsh environment for the student, and demands serious efforts to explore and reach its limits. The characteristics of the jagged study

zone are derived from the closed and open learning environments. We identify four main requirements for a jagged study zone by combining the strengths and weaknesses of the closed and open learning environments and by countering their weaknesses and threats.

Features derived from closed learning environments:

The goal awareness and skill learning identified as strengths of a closed learning environment and the corresponding opportunities of learning by gaming and utilization external motivation translate into collaborative tools for achieving meaningful goals in the jagged study zone (first requirement). The tools help students to understand their goals and to scaffold them in reaching the goals. External motivation and the competitive gaming element can be attained by introducing a collaborative element into the learning process, where the students help each other and may get inspired by each others' progress and skills.

The closed learning environment tends not to support initiative and it suppresses creativity. From this emerges the threat of training students into tunnel-visioned robots without inquiring minds. To counter these weaknesses and threats the jagged study zone promotes the students to learn creative problem solving and versatile meta-skills for survival such as self-evaluation in a harsh learning environment. This can be conducted by allowing the students the opportunities to solve fuzzy problems and to deal with uncertainty in the jagged study zone (second requirement).

Features derived from open learning environments:

When combining the best features of open learning environments, we can extract the third requirement for jagged study zones. The open learning environment promotes creative problem solving by letting the students to make their own choices and select their own paths. In jagged study zones the student must take challenging actions by self-initiated and self-regulated construction during the learning process.

The weakness of the open learning environment is that it often leaves the student alone with his choices. There is plenty of space to go, but there is no guidance for a student who gets lost. To counter this threat we need adaptive methods for getting out of deadlocks and traps (fourth requirement). If we do not want to rely on automated methods, it is always possible to use peer-help in identifying the traps. This can be achieved for example by social navigation (Munro 1999), i.e. making the actions of every individual visible to other individuals.

Summary of requirements for a jagged study zone:

1. In the jagged study zone there are collaborative tools for achieving meaningful goals.
2. The jagged study zone equips the students with an opportunity to solve fuzzy problems and deal with uncertainty and unexpected phenomena.
3. During the learning process the student must take challenging actions by self-initiated and self-regulated construction.
4. Adaptive methods for getting out of deadlocks and traps, or peer-help based on for example social navigation.

Example of a jagged study zone as a landscape

The jagged study zone concept can be illustrated by a jagged desert landscape where one can find for example following things:

Oasis:
An oasis is a place where learner can stop at to find inspiration, guidance and even amusement.
In the oasis the student can find refugee if she gets lost during her explorations in the jagged landscape. There can be attractions and guides at the Oasis to motivate student. The Oasis can for example include a hut with a mirror, which the student can use as a tool for self-evaluation.

Inspiration points:
Inspiration points provide the student with fresh stimuli, for example as distance thought models operate in idea generation. These can appear to the student as a *mirage* in the desert. Inspiration points may include ideation tools and they can may be created and inserted by a teacher.

Workshops:

The workshop is a place where the student can find tools that help the student in exploration. The tool may include visualization, writing applications and collaborative devices. For example, *learning seeds* (Kurhila and Sutinen 1999) can be processed in a workshop.

Learning seeds:
In the landscape, the learner can find learning seeds, which are planted by the teacher or fellow learners. These can be parts of learning material, exercises, ideas and visual presentations. The seeds can "grow" from the actions other learners make, i.e. the learners work on a written assignment by commenting each other's input. The seeds can also grow by some other function, for example by some pre-defined rules. This is particularly suitable if the seeds are a part of an artificial world consisting simulated events in time and space. It is possible that a prosperous, well-surviving and well-nourished learning seed can grow to be an inspiration point in the landscape.

Viewpoints:
The learner can use the viewpoint to gaze over the landscape. In this way the learner can review his journey in the landscape. It is also possible that a learner can view his journey in respect to other learners' journeys, incorporating social dimension also to the *evaluation* of the learning process. In addition, the more traditional way to exploit the learning history is that the teacher can use the viewpoints to track and possibly intervene (help, guide, advise) learners as they explore the landscape.

3. Examples of supporting jagged study zones

Context 1: Virtual platforms. In the current course delivery systems, such as WebCT or Learning Space, the jagged study zone idea is not supported. The systems offer rigid, often similar, solutions to the design of learning situations. According to the jagged study zone concept, the virtual platforms should offer ways to implement stimulating learning situations. At the current time the construction of stimulating features to learning landscapes remains almost entirely on the hands of the teacher.

Context 2: Computer Science teaching. In the Virtual Approbatur project at the Department of Computer Science, University of Joensuu in Finland, the design and implementation of virtual courses is based on the analysis of students' needs according to the Candle scheme (Haataja et al. 2001). On the other hand, the Candle scheme is derived from the concept of jagged study zones. For example the visual tools, like algorithm animator Jeliot (Haajanen et al. 1997), offer a student a way to actively strengthen the understanding of programming concepts. Visual tools give students the aid for grasping the theoretical aspects of programming. Furthermore, one of the ways to realize the jagged study zone concept would be to use students' unfinished learning materials and blurred learning goals (tasks). In fact, the starting point might be an entirely incorrect version of an algorithm. The following trouble-shooting activity by Jeliot is an utmost characteristic of a jagged study zone. Thus, Jeliot inspires the students to work with the material deeply to make it more suitable for achieving the learning goals.

The Empirica Control environment gives a student tools to study a phenomenon that takes place in his physical neighborhood. Thus, the observed circumstances are far from ideal ones describing abstract models. This *noise* – representing the jagged feature of Empirica – supports him towards his own efforts in the learning process.

Context 3: Adaptive learning environments. Adaptive learning environments have evolved from intelligent tutoring systems (ITS) towards more comprehensive hypermedia-based environments with adaptive presentation and adaptive navigation support (Brusilovsky 2000). Most of the intelligent tutoring systems do not provide the learner with learning materials: the knowledge required is acquired outside the system, and the ITS provides only a platform for helping the learner in the process of problem solving. Today the trend is to offer an environment where the learning material is browsed in an adaptive manner. It should be noted that in reality only a few systems can offer this, since providing adaptation is never a straightforward task to design and implement.

When fitting the jagged study zone model to a hypothetical adaptive learning environment, there is a need to think the concept of adaptive learning environments more broadly. For example, collaboration can be achieved when users are not modeled as individuals but as groups. This poses a noted problem (Beck et al. 1996), but one solution is to use probabilistic models to form or just suggest groups of individuals, where the group has sufficient potential to tackle the learning tasks (requirement 1 of the jagges study zone model). Requirement 2 of the jagged study zone can be supported by standard adaptive navigation support if the learning environment is based on hyperlinked material, or with adaptive scaffolding which can mean intelligent and interactive problem solving support. Requirement 3 can be

supported with unpredictable components generated by random algorithm for inspiration points thus bringing up the motivation.

To provide any kind of individual adaptation requires the learner to be modeled in some way. The model is always an approximation of reality and thus imperfect. Therefore, an adaptive learning environment can easily be a "sweatshop" if the environment is too rigid and the modeling is conducted inappropriately. However, slightly imperfect learner modeling is in complete harmony with the fourth requirement listed for the jagged study zone model. If there is a need to shift the emphasis from modeling the learner artificially to human (peer) evaluation, we can incorporate the idea of social navigation to the environment to identify when learners or groups of learners are facing traps and deadlocks.

Context 4: Woven Stories. The concept of woven stories can be briefly described as several authors writing a story in a shared virtual space (Harviainen et al 1999, Gerdt et al, 2001). The difference between the woven stories idea and collaborative writing becomes evident in their functions: the writers of a woven story engage in a dialogue of storytelling rather than concentrating on an effort to produce a joint document. The shared virtual space, where the authors write the woven story is a place where the writers may be inspired by the writings of the others, take part in writing a twist into an existing storyline, compare one's writings to other contributions or simply write a story for others to read.

A system realizing the concept of woven stories can be used as a collaborative learning environment. The concept of woven stories fits well with the jagged study zone model. The shared functions of the virtual space offer tools to authors or learners, with which they can produce and link texts to achieve goals which are of communal or individual importance (requirement 1). Writing and re-writing text is a good way to reiterate an original problem definition and to elaborate better and better solutions via partial or preliminary ones (requirement 2). A system for woven stories can include mechanisms monitoring the students to notice any lost students. These mechanisms, for example periodical reports and alarm triggers, can be used to inform teachers and tutor students that intervention is needed (requirement 4). This information can be relayed to the lost student too, so that she realizes her situation and may benefit from the scaffolding facilities of the environment.

The authors of a woven story may link their story passages to other authors' passages, thus including their contribution into a story that is being written by other authors. From an another point of view they may include a piece of somebody else's story into one's own story. When the students link their stories to others' stories and participate in the creation of a storyline they must make challenging choices (requirement 3). The students must relate their creations to writings of others, maybe adapting their contributions somewhat.

4. The roles of students vs. teachers in learning environments with jagged study zones

It is important that there is a balance between the student autonomy and the teacher guidance in jagged study zones. In principle, there is always a responsibility for a teacher to make sure that the students are working towards the goals set for the course or equivalent. On the other hand, student autonomy, especially the decision making skills and the readiness to take responsibility do not develop if they do not have situations where to get relevant experience. These aspects can be readily observed in certain types of computer games, but in jagged study zones they appear in more realistic ways.

In a modern learning environment it is important, that the learner is able to work creatively and join various teams for brainstorming and other forms of ideation processes. It is also important, that the learner is able to co-operate with a number of specialists, one of them the teacher, but some being fellow students possibly reached over the Web etc. Even motivating and guiding feedback is available in natural forms in workshops of jagged study zones.

The teacher's role in a jagged study zone is that of a wilderness guide, a ranger who is aware of potential threats, risks, opportunities, and challenges meeting all explorers in the unknown. Students can be seen as scouts, at a proximal zone of new findings, reorganizing, and changing earlier knowledge structures. While a single hunter and trapper may sometimes have reasonably good life, high mountain tops or most extreme wilderness can be reached only by teams. Positive group dynamics within the trekking team is essential – collaborative learning of higher order (thinking) skills is dependent truly on the success/survival of every team member. The team makes use of heterogeneous and versatile skills of each one. This metaphor relates also directly to research work, but any learner is equally exploring her environment for knowledge and skills that are new to her.

5. Concluding remarks

Today, in our society indifferent attitudes are common. In many occasions the attitudes towards learning and education are similarly indifferent. The student will not succeed with this type of unconcerned attitude in jagged study zones. The students have to make a stand, form an opinion, to act, to really stick their hands on the mud.

It is possible to identify jagged traces in the existing learning environments, as the examples taken from Empirica, Jeliot, and Woven Stories indicate. However, to bring the idea of jagged study zones not just a feature of a computer-supported learning process, but an all-embracing principle thereof needs determined action. This will be our agenda in both designing novel educational environments as well as evaluating their power and usefulness.

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